Kernel based pattern analysis methods using eigen-decompositions for reading Icelandic sagas

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Kernel based pattern analysis methods using eigen-decompositions for reading Icelandic sagas

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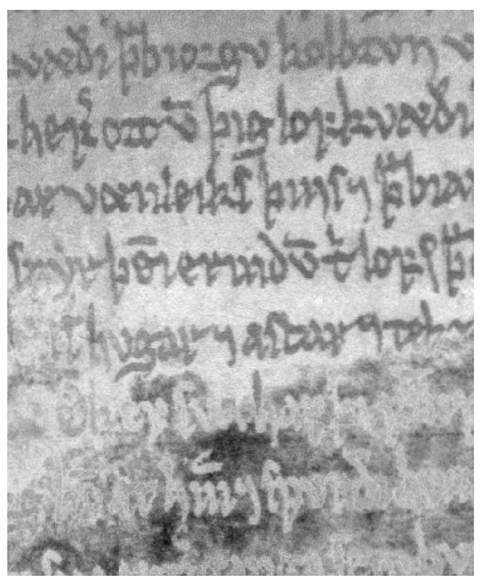
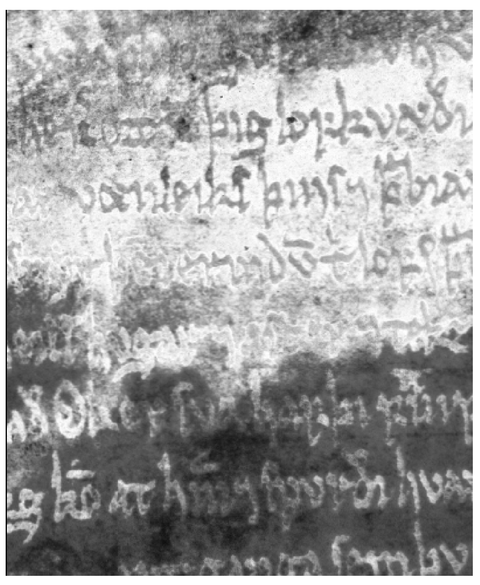
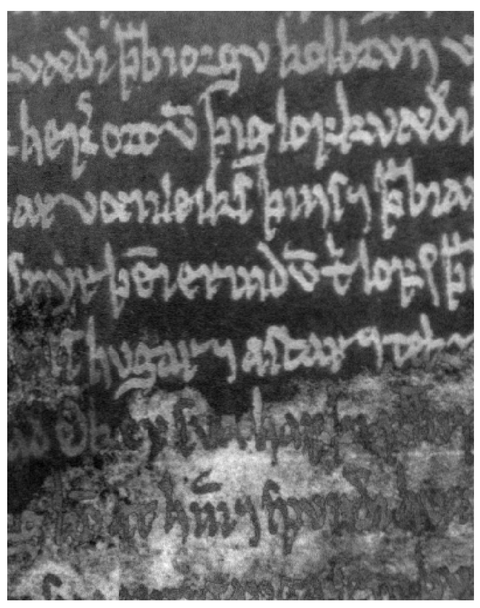
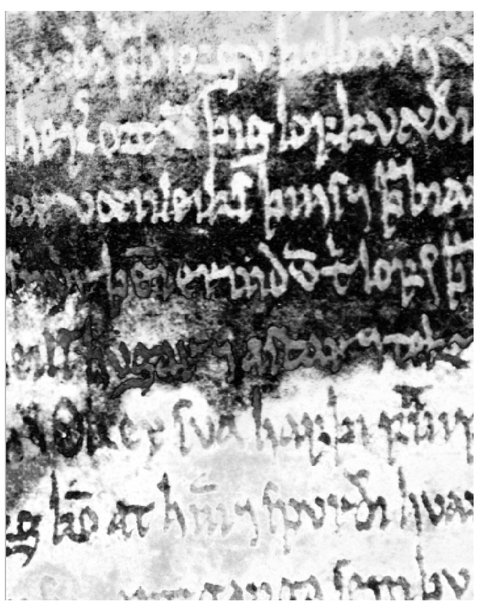
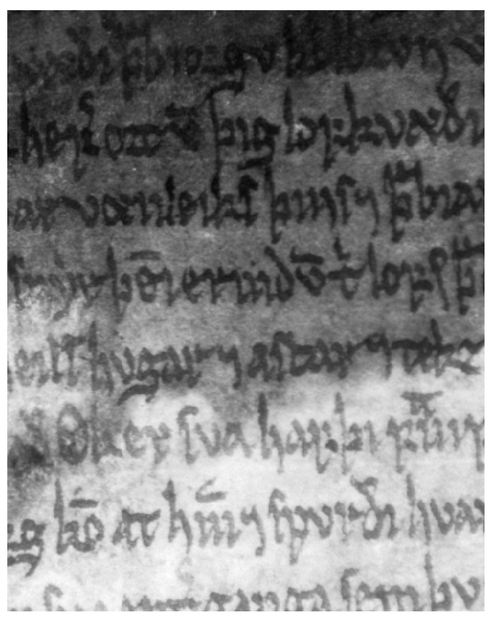
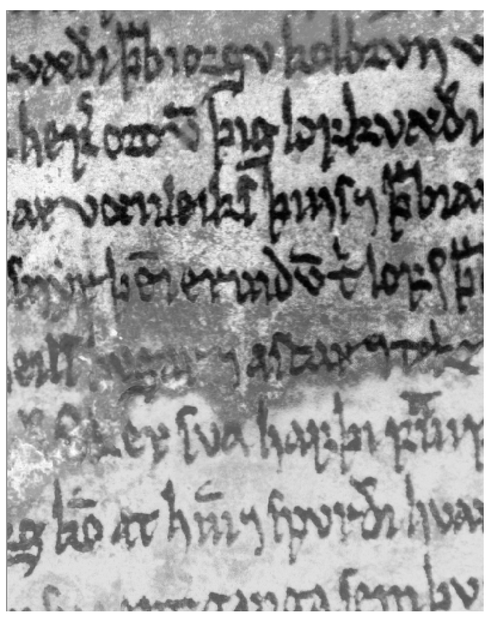
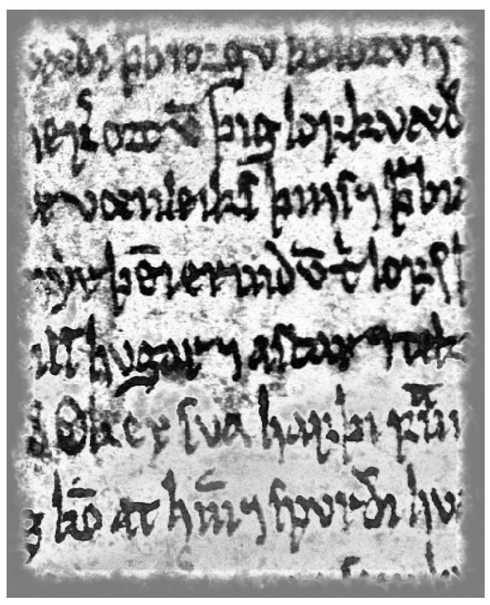
We want to test the applicability of kernel based eigen-decomposition methods, compared to the traditional eigen-decomposition methods. We have implemented and tested three kernel based methods methods, namely PCA, MAF and MNF, all using a Gaussian kernel. We tested the methods on a multispectral image of a page in the book 'hauksbok', which contains Icelandic sagas.

The book 'hauksbok', which is written around the 14th century. Part of the book is unreadable because of large stains.

The sagas are scanned using VideometerLab, which produces multispectral images.

	Traditional eigen-decomposition methods	Kernel based eigen-decomposition methods
Principal components analysis		
Maximum auto-correlation factors analysis		
Minimum noise fraction factors analysis		

The stain on the page makes it difficult to read the text no matter the method. A simple solution to this is to remove the stain beforehand by subtracting an average filtered image. An example of this is seen on the right.



Conclusion

We think the kernel based MNF produced the best result, especially because you can set the width of the Gaussian kernel to fit with what you want to find (in this case the letters). Furthermore the MNF removes the big stain when you set the size of the filter large enough. One big disadvantage of kernel based methods is the time and space consumption compared to the ordinary methods.